ADEL
INSTRUMENTATION

User Manual

Temperature
and Humidity Sensor

THS Sensor 52 12DC RS485

The **THS SENSOR 52 12DC RS485** is an air temperature and humidity sensor with serial communication interface RS485 for transmitting measured values to a master device. It can be used in computer controlled measurement systems or as a peripheral device to a large-size LED display, which displays the measured values.

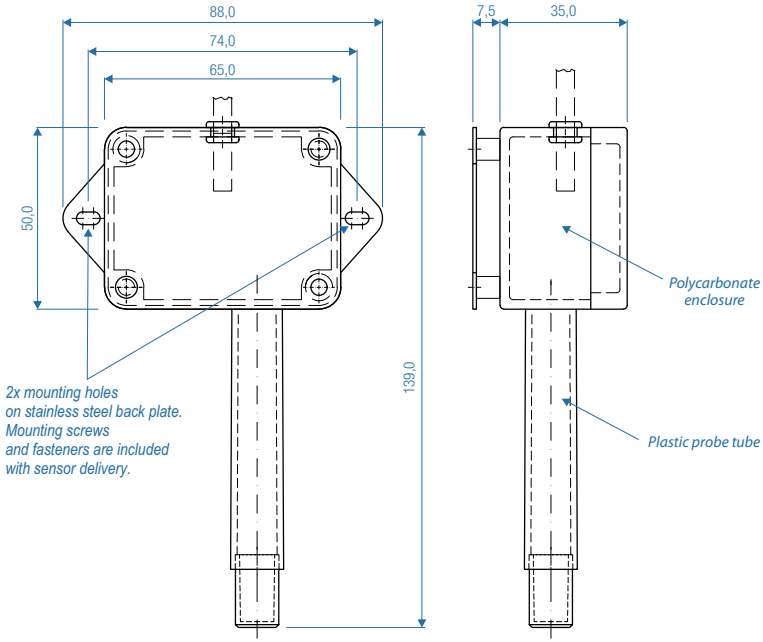
RS485 Connector pinout:

Yellow - 12 VDC
Green - GND
White - B (D-)
Brown - A (D+)

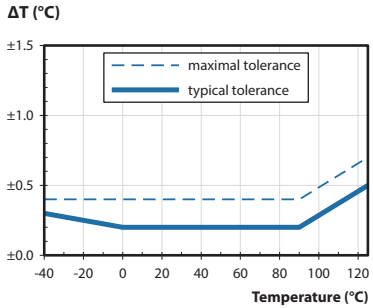
Technical Specifications

Sensor type	Sensirion SHT31-DIS
Temperature range	–40 °C to +80 °C
Typical temperature accuracy	±0,3 °C (±0,2 °C for T>0 °C)
Relative humidity range	0 to 100 % RH
Typical relative humidity accuracy	±2 % RH
Communication interface	RS485 (without galvanic isolation)
Communication protocol	Modbus RTU
Port connector	EUROCLAMP SH04-5,08 (cable length 5 m)
Software	*DataLoggerTH* for Windows (available for download)
Environment of use	interior or exterior (IP 52)
Power supply	7 to 32 VDC (without galvanic isolation)
Compatibility	used with LED displays NDA series, or as stand-alone device

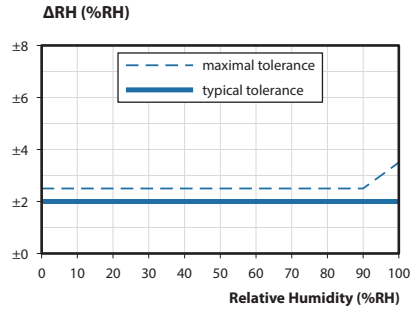
Dimensional Drawing (mm)



Graphs - Sensirion SHT31 Parameters



Graph No. 1: Accuracy for temperature in °C.



Graph No. 2: Accuracy for relative humidity at 25°C .

MODBUS Communication Description of Available Registers and Functions THS Sensors v. 2.1

(rev. 1.0)

1. THS Sensor Configuration

The sensor device contains registers, which are divided into groups and are used to store various configuration settings. Functions **Read Holding Registers (0x03)**, **Write Single Register (0x06)**, or **Write Multiple Registers (0x10)** can be used to access these registers. Although each register is 16 bits wide, its LSB (Least Significant Byte) is used only. All values are entered as ASCII characters, except for the Modbus address and offset correction, which are binary. Functions 0x03 and 0x10 support both reading and writing of certain registers, while the address of the first and last registers must be within the valid range.

Read Holding Registers (0x03) / Write Single Register (0x06) / Write Multiple Registers (0x10)				
Address	**Description**	**Valid Values**	**Default Value**	**Data Type**
1000	Modbus address	1 – 247	1	uint8_t
1001	Communication speed	'0' – 1200 Bd '1' – 2400 Bd '2' – 4800 Bd '3' – 9600 Bd '4' – 14400 Bd '5' – 19200 Bd '6' – 38400 Bd '7' – 57600 Bd '8' – 115200 Bd	'5'	ASCII
1002	Number of data bits	'5', '6', '7', '8'	'8'	ASCII
1003	Parity	'N', 'O', 'E'	'E'	ASCII
1004	Number of stop bits	'1', '2'	'1'	ASCII
1005	CONTROL	0 – 255	0	uint16_t
1006	Reserved			
1007	Behavior in case of configuration error	'0' – set default settings '1' – use configuration settings	'0'	ASCII
1008	Type of sensor device element	'1' – SHT21 '2' – DS18B20 '4' – STS21 '5' – SHT31 '6' – STS31	'5'	ASCII
1009	Communication protocol	'1' – YDN v.1, 9600 '2' – YDN v.2, 19200 '3' – MODBUS '4' – MODBUS TCP	'3'	ASCII
2000	Correction of temperature in tenths of °C	-99 – 99	0	uint16_t
2001	Temperature units		'C'	ASCII
2200	Correction of temperature in tenths of %RH		0	uint16_t

Notes:

- *Writing a new value into register has no influence on device functionality until the application restarted (off/on), or when the corresponding value into the CONTROL register is written (REINIT).*
- *Communication speed is the speed of application with the configurator as well as the speed of communication with a host, (reading measured values, configuration, version, etc.).*
- *Application behavior in case of configuration error:*
  - *‚0' - default values will be set, while the application will continue with these default values*
  - *‚1' - application will enter status when communication with configurator will be possible only (configuration protocol) – this is indicated with fast blinking of the LED. It is not possible to read measured values (communication with sensor is off).*
- *Protocol YDN v.2 is essentially the same as YDN, the only difference is in communication parameters, which are fixed to 19200-8-E-1.*

2. Reading Firmware Version

Device firmware version is stored in two registers starting from address 5000. These registers can be accessed using function **Read Holding Registers (0x03)**. Data is stored in ASCII format and LSB of the register is used only.

Read Holding Registers (0x03)			
Address	**Description**	**Example**	**Data Type**
5000	Major version	'2' (0x0032)	ASCII
5001	Minor version	'1' (0x0031)	ASCII

3. Reading Measured Values

The measured temperature, relative humidity, or CO2 concentration value are stored in 21 registers starting from address 0. These values are in binary format and can be read with function **Read Holding Registers (0x03)** or **Read Input Registers (0x04)**. If the sensor chip does not support certain measurement, it is disconnected, or there is communication error, returned value will be 9999, which corresponds to 999.9°C, or 999.9 %RH. In case the sensor chip is faulty, the application will try to reinitialize it every 5 seconds.

Read Holding Registers (0x03) / Read Input Registers (0x04)			
Address	**Description**	**Example**	**Data Type**
0	Measured temperature in tenths of °C or °F (sensor 0)	0x00DF (223) = 22,3 °	int16_t
10	Measured relative humidity in tenths of % (sensor 0)	0x01C2 (450) = 45,0 %	int16_t

4. Identification of Device

In order to identify the sensor in MODBUS network, THS supports function **Report Slave ID (0x11)**. THS sensor will send message with:

- Device ID, which depends on the actual sensor type used:
  - 0x01 SHT21
  - 0x02 DS18B20
  - 0x06 SHT31
  - 0x07 STS21
  - 0x08 STS31
- Indication of running 0xFF, if sensor is functional, or 0x00, if sensor is disconnected or there is communication failure with the sensor.

5. CONTROL Register

Address 1005 holds the CONTROL register. It is accessible with functions **Read Holding Registers (0x03)** and **Write Multiple Registers (0x10)** or **Write Single Register (0x06)**. This register is initialized to 0 during startup. Writing into register is protected with password, which is the MSB value of register. LSB is value, which in case of correct password, is written into CONTROL register. CONTROL register stores binary value, while each bit has its assigned unique function.

Read Holding Registers (0x03) / Write Multiple Registers (0x10)		
Address	**Description**	**Meaning of bits**
1005	CONTROL register	0 – Loading configuration and initialization (restart of application) 1 – Setting default values 2 ... 7 – Not used

MSB – ACCESS PASSWORD							
15	14	13	12	11	10	9	8
1	0	1	0	0	1	0	1

LSB – CONTROL							
7	6	5	4	3	2	1	0
–	–	–	–	–	–	DEFLT	REINIT

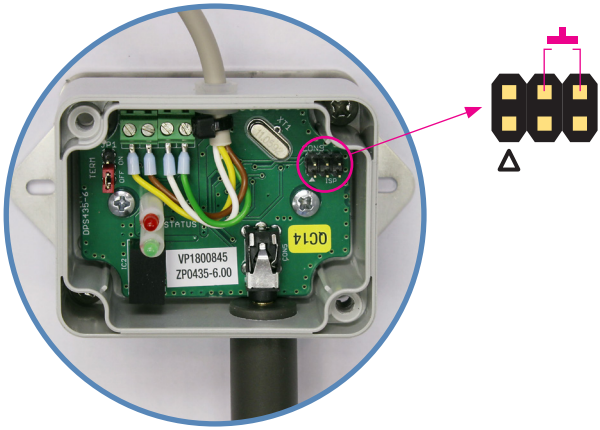
Notes:

- *Password for access to register is 0xA5.*
- *It is advised to use function REINT after making changes in configuration registers, which were performed using one of the accessible Modbus functions. After execution of function it is set to 0.*
- *Function DEFLT can be used to set default values into the configuration registers. Changes will take affect after application restart (off/on), same as when writing configuration, or after writing corresponding value into CONTROL register (REINIT). In this case, the REINIT function responds at the rate at which the request was triggered. The communication speed will not change until the acknowledgment is sent. When the function is performed its value is set to 0.*
- *DEFLT and REINIT functions can also be requested at the same time (with one entry into the register).*

6. Reset to Default Settings (valid for firmware version 3.2 and up)

If needed, it is possible to recover default settings for UART "19200-8-E-1" and sensor address "1". Perform the following procedure:

1. Disconnect the power supply from sensor. (For PoE devices disconnect sensor from LAN.)
2. Use jumper to short pins 4 and 6 of the header connector (see picture below).
3. Connect the power supply to sensor.
4. Depending on what is the desired communication protocol, leave the jumper in position or power applied for the following time period.
    a. t > 5 seconds…..default settings + MODBUS RTU protocol, green LED turns ON.
    b. t > 10 seconds...default settings + MODBUS TCP protocol, green LED turns OFF.
5. Remove jumper from the header connector!



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